

REMARKS

Applicants have amended their claims in order to further clarify the definition of various aspects of the present invention. Specifically, Applicants have amended each of claims 1, 2 and 3 to delete recitation that the polymer B is a vinylic polymer and/or copolymer having at least one nitrogen atom in a "molecular skeleton"; and have further amended each of claims 1, 2 and 3 to recite that the amount of a monomer containing a carboxyl group is in a range of from 2 mol% to 50 mol% based on the total monomers of the polymer A, and the amount of a monomer having the nitrogen atom is in a range of from 2 mol% to 50 mol% based on the total monomers of the polymer B.

Moreover, Applicants are adding new claims 4-19 to the application. Claims 4, 12 and 16, dependent respectively on claims 1, 2 and 3, recite that the monomer having the nitrogen atom is selected from a specific group of compounds; and claims 5, 13 and 17, dependent respectively on claims 1, 2 and 3, recite that the monomer containing the carboxyl group is acrylic acid or methacrylic acid. Claims 6, 14 and 18, dependent respectively on claims 1, 2 and 3, recite a total light transmittance and absolute value of refractive index for the optical element molded into a 50 μm film; and claims 7, 15 and 19, dependent respectively on claims 1, 2 and 3, recite Tg of the polymers A and B. Claims 8 and 9, each dependent on claim 1, respectively defines weight average molecular weight of the polymers A and B, and further defines amount of monomer containing the carboxyl group and amount of monomer having the nitrogen atom. Claims 10 and 11, each also depend on claim 1, defines Tg of one of the polymers A and B, and defines mixing ratio of the polymers A and B.

In connection with amendments to the previously considered claims, and in connection with the newly added claims, note pages 13-22, as well as Table 2 on page 30, of Applicants' Substitute Specification submitted with the Response to Notice to File Corrected Application Papers submitted October 27, 2004 (hereinafter "Substitute Specification").

The rejection of claims 1-3 under the second paragraph of 35 U.S.C. §112, as being indefinite, set forth in Item 3 on page 2 of the Office Action mailed February 14, 2006, is noted. Applicants have amended each of claims 1-3 to delete recitation that the polymer B that has the atomic group capable of forming an intermolecular hydrogen bond in a molecular side chain and/or in a molecular skeleton of the polymer molecule, has at least one nitrogen atom "in a molecular skeleton", so that claims 1-3 recite that such polymer B has at least one nitrogen atom "in a molecular side chain". In view of present amendments to claims 1-3, it is respectfully submitted that the basis for the indefinite rejection as set forth in Item 3 on page 2 of the Office Action mailed February 14, 2006, is moot.

Applicants respectfully submit that all of the claims presented for consideration by the Examiner patentably distinguish over the teachings of the prior art applied by the Examiner in rejecting claims in the Office Action mailed February 14, 2006, that is, the teachings of U.S. Patent No. 4,462,665 to Shah, under the provisions of 35 USC 102 and 35 U.S.C. 103.

It is respectfully submitted that this reference as applied by the Examiner would have neither taught nor would have suggested such an optical element as in the present claims, formed by molding a molding material which is a pseudo cross-link resin composition comprising at least two polymers A and B, and wherein, inter alia, an amount of monomer containing a carboxyl group is in a range from 2 mol%

to 50 mol% based on the total monomers of the polymer A, and an amount of a monomer having a nitrogen atom is in a range from 2 mol% to 50 mol% based on the total monomers of the polymer B, with an intermolecular hydrogen bond being formed between the polymer A and the polymer B or copolymers thereof when the polymer A and the polymer B (or copolymers thereof) are mixed together. Note each of claims 1-3.

In addition, it is respectfully submitted that the applied reference would have neither taught nor would have suggested such optical element as in the present claims, having features as discussed previously in connection with claims 1-3, and, furthermore, including (but not limited to) wherein the monomers having the nitrogen atom are selected from the group as set forth in claims 4, 12 and 16; and/or wherein the monomer containing the carboxyl group is acrylic or methacrylic acid (see claims 5, 13 and 17); and/or wherein total light transmittance and absolute value of refractive index of the optical element is that set forth in claims 6, 14 and 18; and/or wherein Tg of polymer A and/or polymer B is that set forth in claims 7, 15 and 19, or is that set forth in claim 10; and/or molecular weights of the polymer A and polymer B as in claim 8; and/or further recitation of amount of monomer containing the carboxyl group and monomer having the nitrogen atom as set forth in claim 9; and/or mixing ratio of polymer A and polymer B as in claim 11.

The present invention is directed to an optical element formed using pseudo cross-link polymers.

As described in the paragraph bridging pages 4 and 5 of Applicants' Substitute Specification, thermosetting resins, which are generally insoluble and infusible cured materials, are particularly excellent in solvent resistance or durability such as strength maintenance rate or the like under high temperatures. However,

since cross-links are formed through covalent bonds, there is a problem in that the thermosetting resins cannot be reproduced.

As a material closest to thermosetting resins that can be recycled, ionomer resins can be cited. In the ionomer resin, a metal oxide or metal hydroxide such as magnesium oxide or calcium hydroxide is added to a polymer having a carboxyl group in its side chain. By forming an ionic bond between the metal and the carboxyl group, a pseudo cross-link point is formed. However, because a bonding force between the metal compound and the carboxyl group is weak, due to factors such as small solubility of the metal compound in the resin, only a slight amount of the metal compound can be added, so that a larger improvement in characteristics cannot be obtained.

In addition, it is desired to provide a material of optical elements, which has not only heat resistance and good mechanical strength, but is also flexible.

Against this background, Applicants provide an optical element achieved by mixing polymers A and B of a specified nature, in specified amounts, wherein intermolecular hydrogen bonds are formed between the polymer A and polymer B (or copolymers thereof), the hydrogen bonds giving a pseudo-structure with a cross-link structure which achieves a product having the desired heat resistance and mechanical strength, yet also having desired flexibility. It is emphasized that according to the present invention, the intermolecular hydrogen bond is formed between the polymer A and the polymer B or copolymers thereof, due, for example, to amounts of components (e.g., monomers) of the polymer A and polymer B, or copolymers thereof, having the carboxyl group and nitrogen atom forming the intermolecular hydrogen bond therebetween.

In addition, the optical element of the present invention, provided by mixing the specified polymers, can be easily manufactured, while providing a material having desired properties.

Moreover, by utilizing polymers having glass transition temperatures as in the present claims, material with desired properties, including desired flexibility, can easily be obtained, through a relatively simple manufacturing process.

As for advantages achieved according to the present invention, attention is respectfully directed to the Examples, Comparative Examples and Reference Examples on pages 27-31 of Applicants' Substitute Specification, and in particular results shown in Tables 2 and 3 on pages 30 and 31 of Applicants' Substitute Specification.

Shah discloses a laminated polymeric product in which one layer of the product is a polymeric blend capable of absorbing a large amount of water to form a hydrogel without dissolution at room temperature, and the other layer, adherent to the first layer, is a tough plastic or polymeric composition which is substantially inert to or resistant to water. See column 1, lines 7-13. The composite article is described most generally at column 2, lines 1-37, and includes a layer of an optically clear blend of (1) 40-98% by weight, based on the total weight of the blend, of a water-soluble polymer of a vinyl lactam having a specified formula, and (2) 2-60% by weight of a water-insoluble copolymer consisting essentially of 50-90% by weight based on the total weight of the copolymer, of a hydrophobic water-insoluble ethylenically unsaturated monomer, 2-12% by weight of an ethylenically unsaturated monomer containing an acid group, and 0-50% by weight of a hydrophilic ethylenically unsaturated monomer free from acidic groups. See also column 7, lines 8-49 of this patent.

It is respectfully submitted that in Shah, the content of, e.g., methacrylamide is much higher than the content of acrylic acid in the non-water-soluble polymer, so that any hydrogen bond is occurring in the non-water-soluble polymer themselves.

In contrast, according to the present invention the polymer A and polymer B are provided utilizing amounts of respective monomers, and wherein the hydrogen bonds are formed between the polymer A and polymer B or copolymers thereof. It is respectfully submitted that Shah would have neither taught nor would have suggested the optical element as in the present claims, with, e.g., amounts of the recited monomers for the respective polymer A and polymer B as in the present claims, and with the intermolecular hydrogen bond formed as recited in the present claims, and advantages thereof; and/or other features of the present invention as discussed previously, and advantages thereof.

In particular, noting T_g as in various of the present claims, it is respectfully submitted that Shah would have neither taught nor would have suggested such feature of the present invention, and advantages thereof.

The initialed Information Disclosure Statement by Applicant enclosed with the Office Action mailed February 14, 2006, is noted. In one sheet thereof, the Japanese Patent Document No. 4-6738 has a line drawn therethrough, apparently indicating that the Examiner has not considered this document. However, as can be seen in the Information Disclosure Statement by Applicant with an "OIPE" date stamp of October 17, 2002 and enclosed with the Office Action mailed March 26, 2003, in prior Application No. 10/171,626, a copy of which is enclosed herewith, the Examiner considered Japanese Patent Document No. 4-6738 in prior Application No. 10/171,626. In view thereof, it is respectfully submitted that the Examiner must consider No. 4-6738 in the above-identified application. Indication of consideration

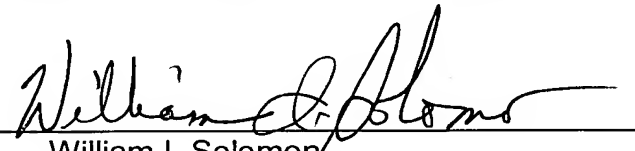
of No. 4-6738, upon further examination of the above-identified application, is respectfully requested.

In view of the foregoing comments and amendments, reconsideration and allowance of all claims presently pending in the above-identified application are respectfully requested.

Please charge any shortage in fees due in connection with the filing of this paper to the Deposit Account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (case No. 1204.41800VX1), and please credit any excess fees to such deposit account.

Respectfully submitted,

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Please find below and/or attached an Office communication concerning this application or proceeding.

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RESPONSE 6/26/03

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Sheet 1 of 1



Form PTO-1449

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

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SERIAL NO.
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**INFORMATION DISCLOSURE STATEMENT
BY APPLICANT**

(Use several sheets if necessary)

APPLICANT
YAMANAKA, et al

FILING DATE
June 17, 2002

GROUP
(not yet assigned)

U.S. PATENT DOCUMENTS

Examiner Initial	Document Number	Date	Name	Class	Subclass	Filing Date
	AA					
	AB					
	AC					
	AD					
	AE					
	AF					
	AG					
	AH					
	AI					
	AJ					
	AK					
	AL					

FOREIGN PATENT DOCUMENTS

Examiner Initial	Document Number	Date	Country	Class	Subclass	Translation /Abstract	
						Yes	No
ss	AM EP 0089086	09/1983	Europe				
ss	AN 3-52910	03/1991	Japan			X	
ss	AO 56-45421	10/1981	Japan			X	
ss	AP 4-6738	02/1992	Japan			X	
	AQ						
	AR						
	AS						
	AT						

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

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